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POLYSOL – Thermal and electrical performance assessment of a cost-effective polygeneration system

1st Nordic Conference on
Zero Emission and Plus Energy Buildings
Towards low carbon built environments

J. Soares, B. Shahzamanian, **S. Varga**, A. Palmero-Marrero, A. C. Oliveira

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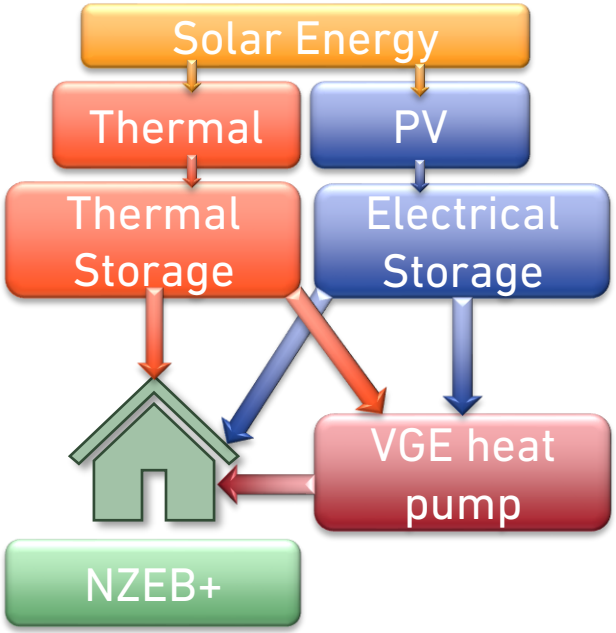
Since 1986

Objectives

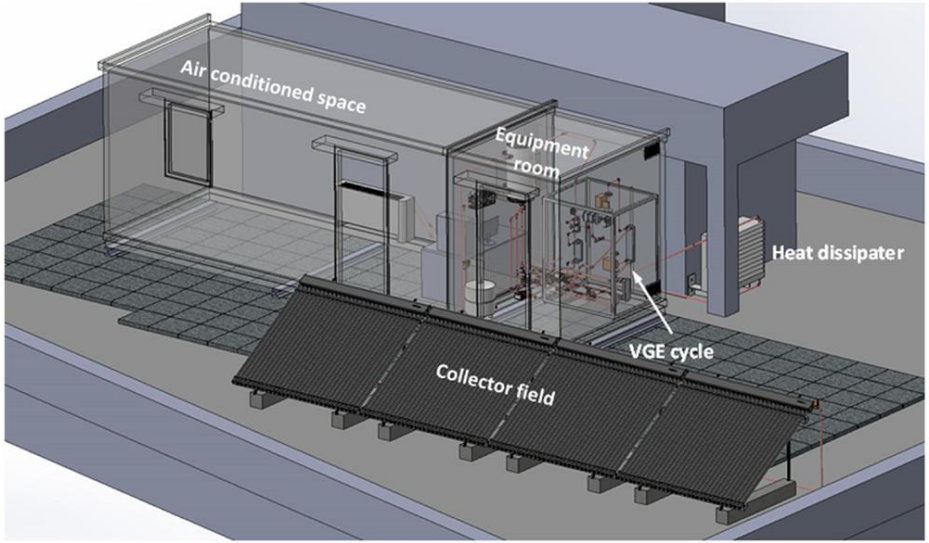
POLYSOL – Development of a polygeneration solar system for Zero Energy Building

The objective of POLYSOL is to develop and evaluate, both numerically and experimentally, a polygeneration system satisfying the electricity, cooling and heating needs of buildings.

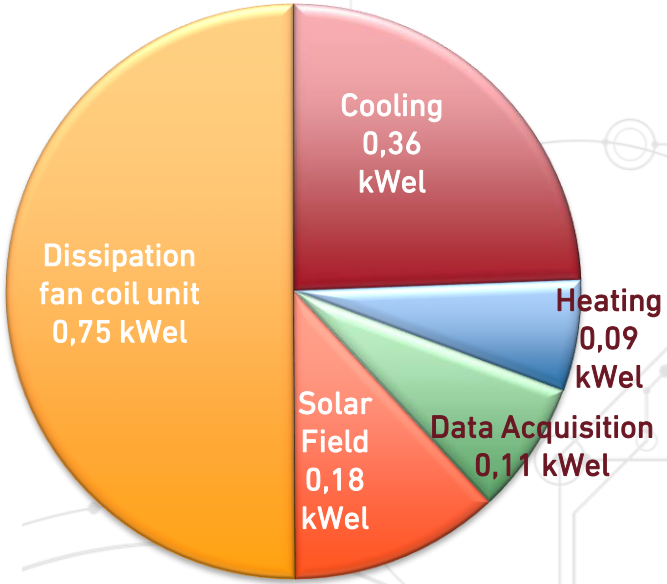


Specific objective: Identification of thermal and electric energy consumption of the test facility throughout the year

Existing Test and Demonstration Facility (TDF)



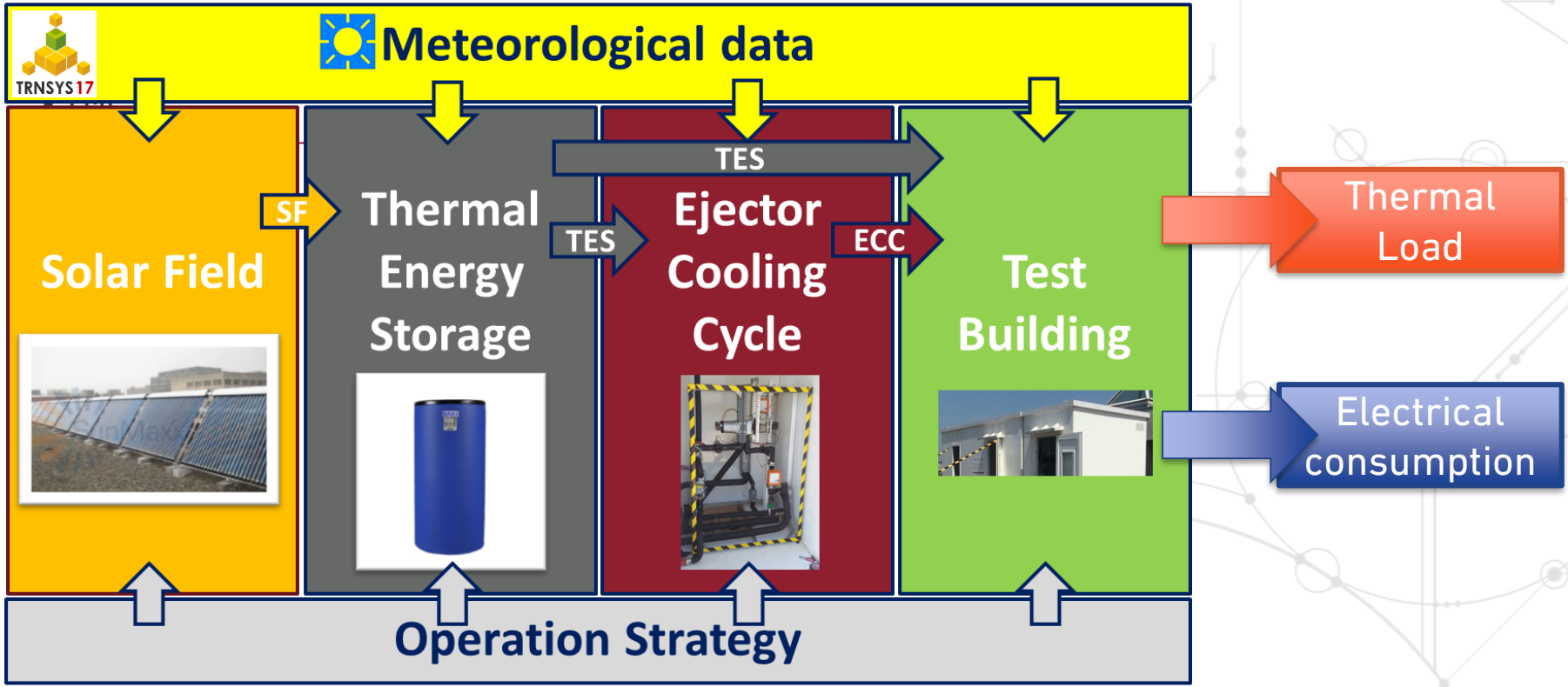
General layout of the TDF



Installed electric capacity (measured)

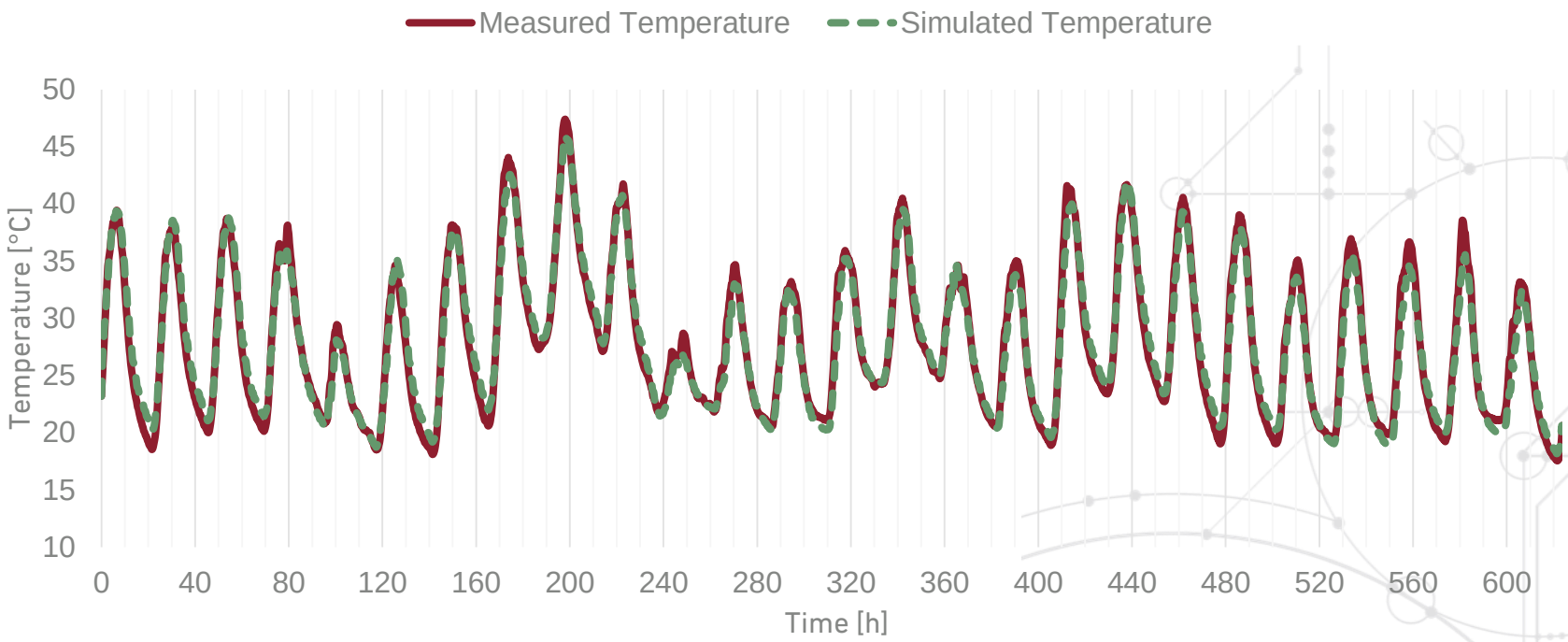
Research methodology

Numerical model for thermal load assessment on the building



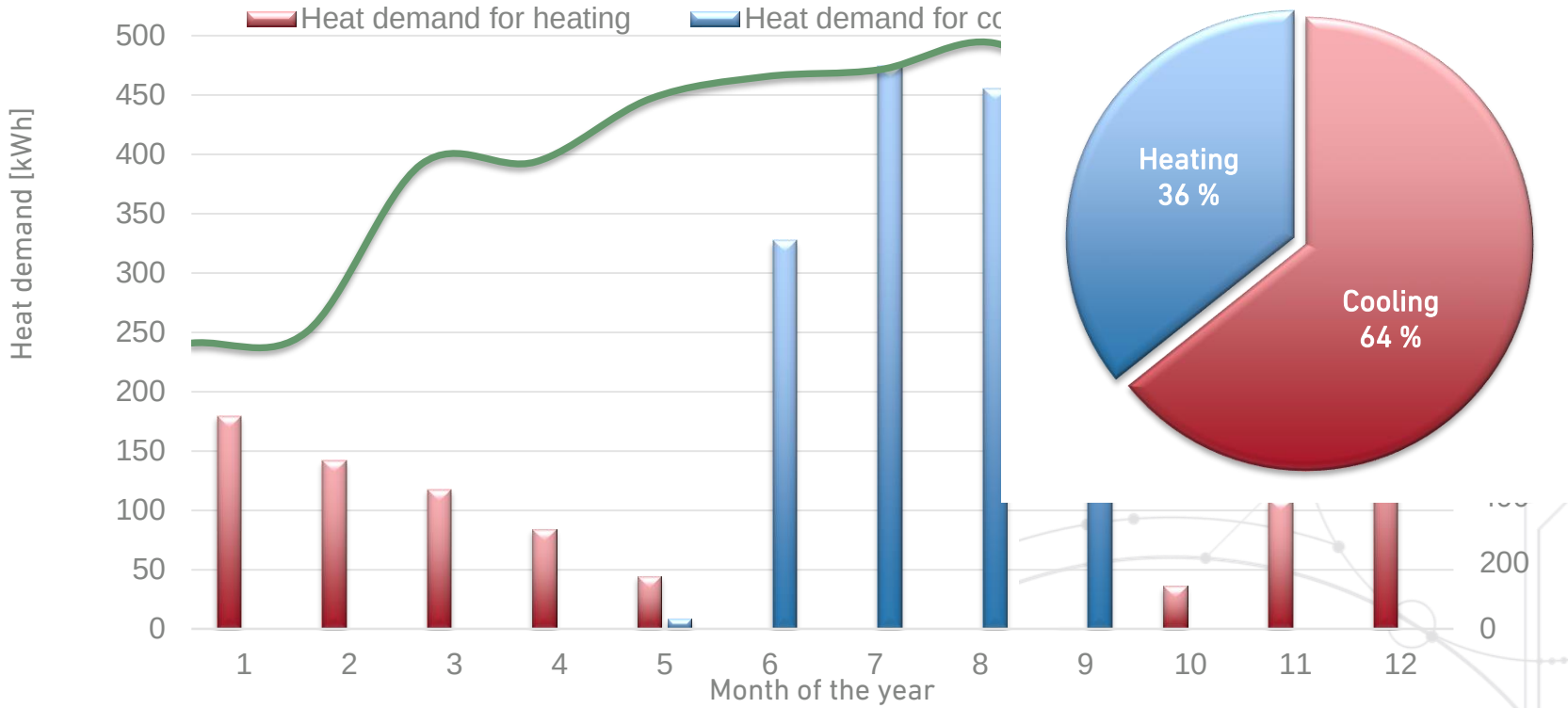
Research methodology

Numerical model validation



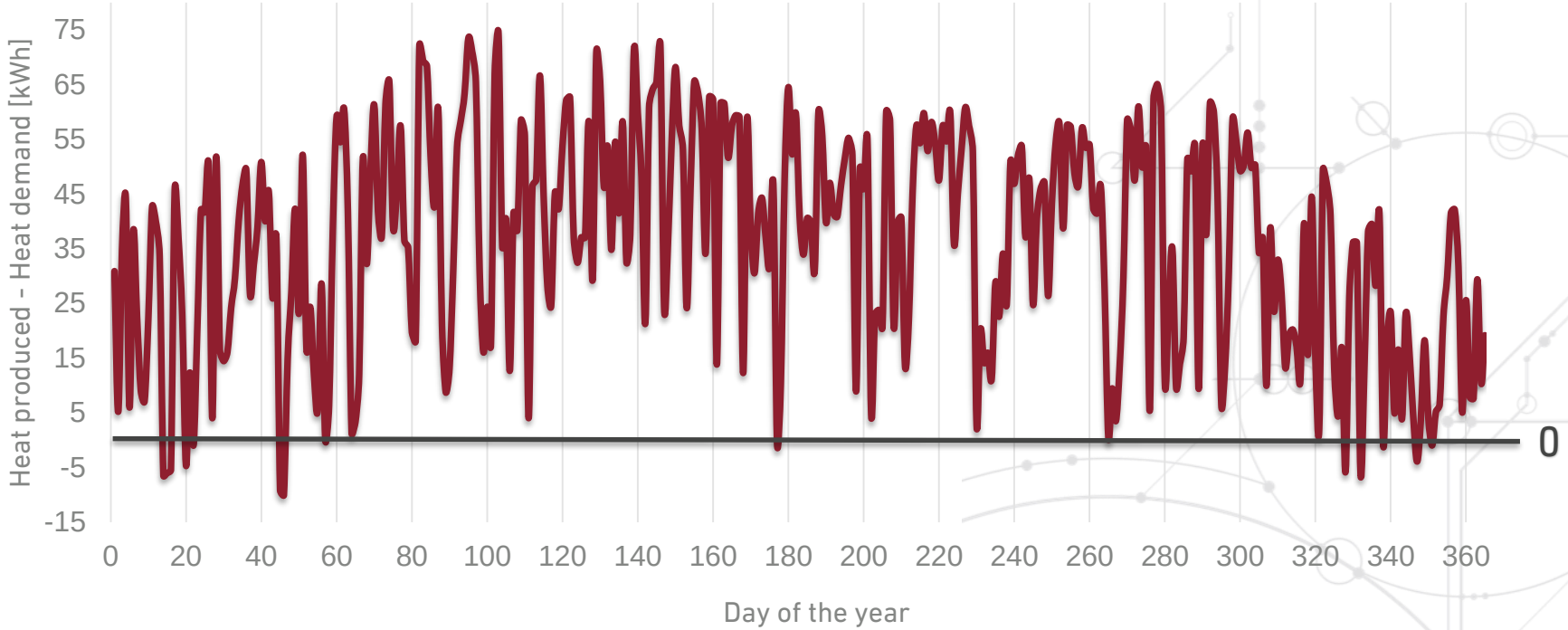
Results

Yearly thermal performance



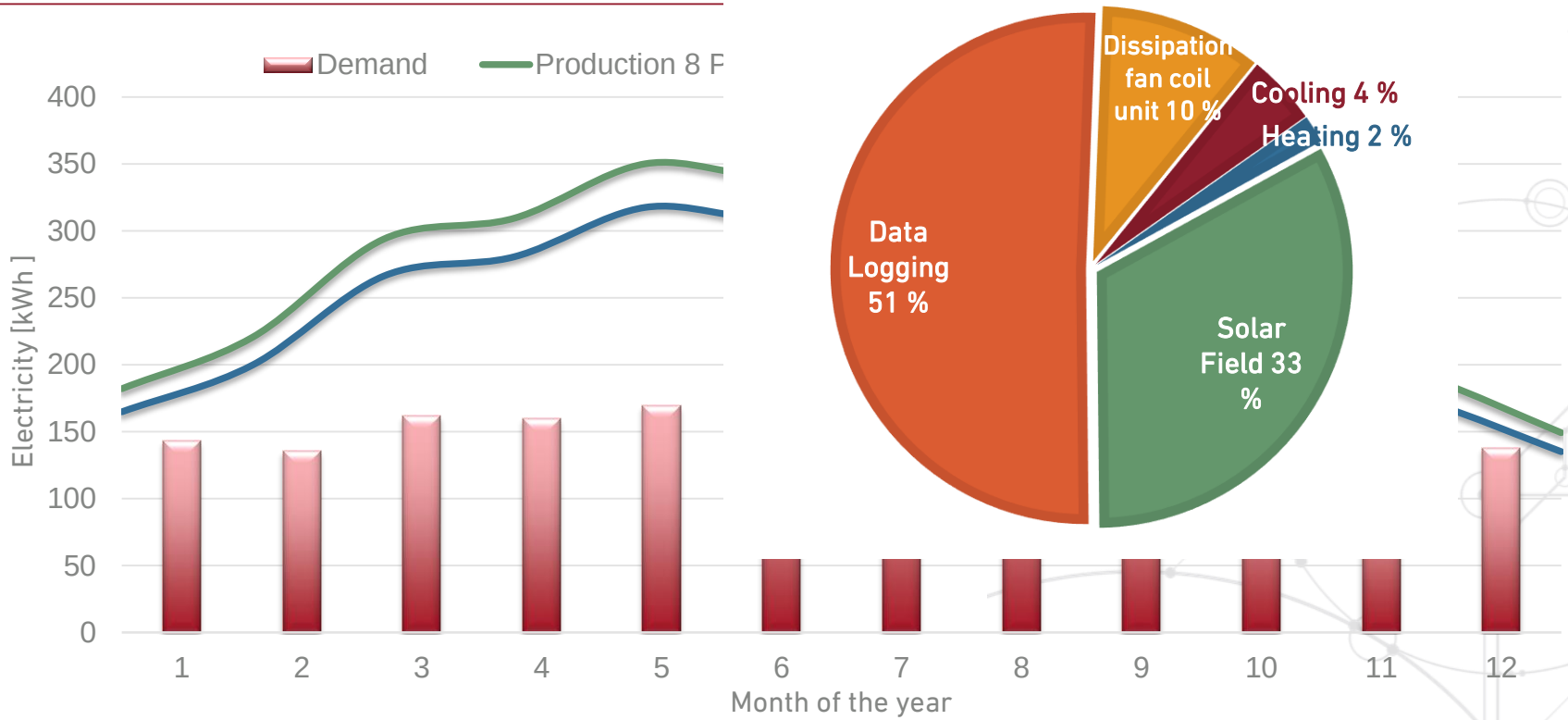
Results

Yearly thermal performance



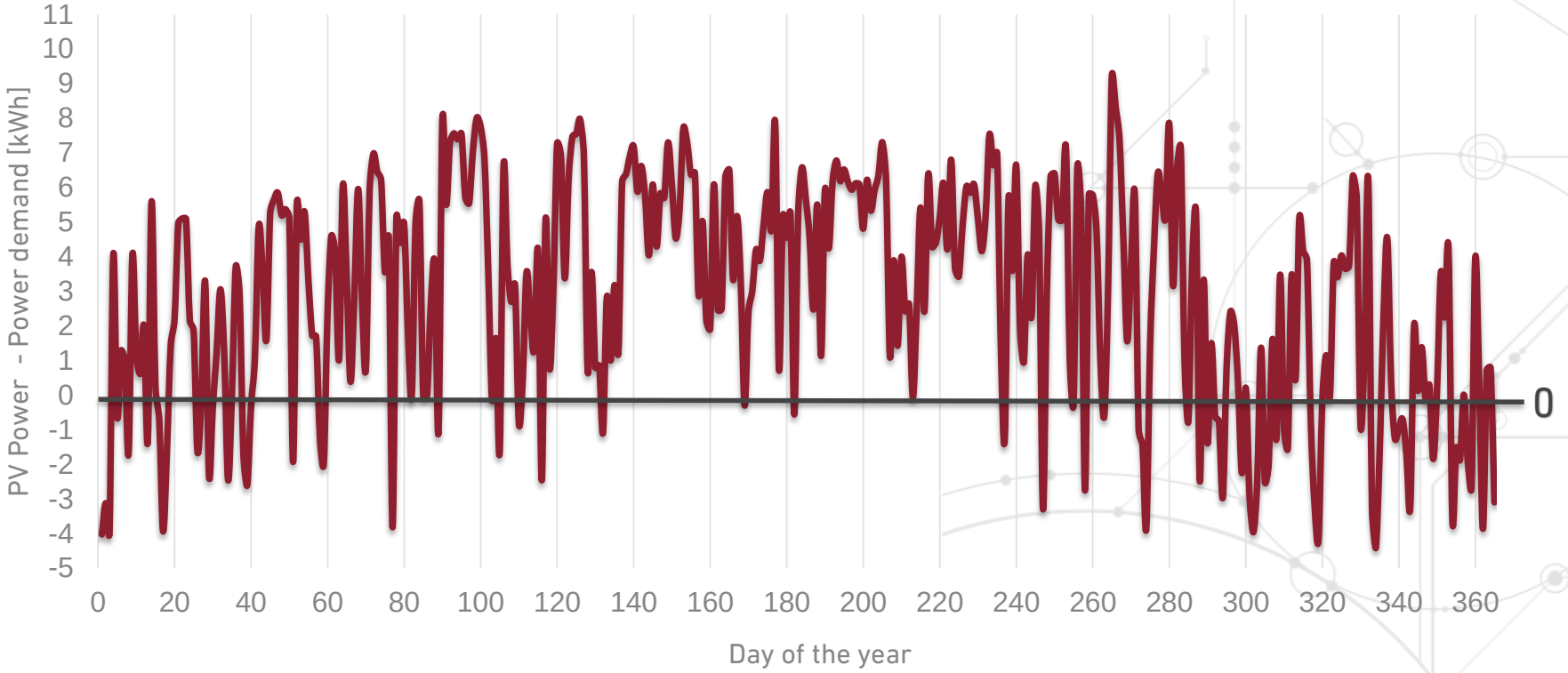
Results

Yearly electrical performance



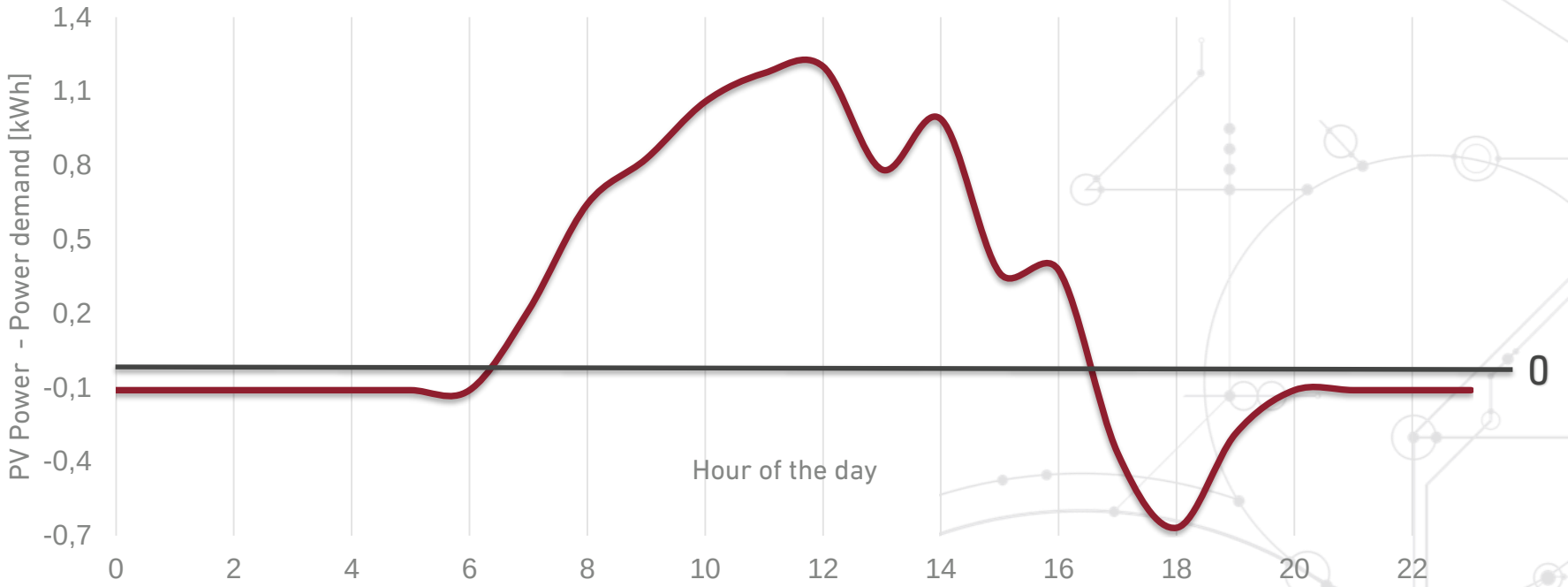
Results

Yearly electrical performance



Results

Electrical performance in a selected summer day – example



Conclusions

Thermal Energy

$Q_{solar,anual} \approx 16\ MWh_{th}$ (about 6 times the demand);

$Q_{demand,\ cooling} \approx 64\ \%$

Shortages on the hourly and daily levels:

- highest cumulative thermal energy deficit (19 kWh_{th}) for the 14th and 15th of February;
- TES will be used. About 37 kWh_{th} excess on the 13th of February;

Electrical Energy

$W_{elect,demand} \approx 1.9\ Mwh_{el}$;

$W_{elect,PV}$ ≈ about 1.6/1.7 times the demand (7 and 8 PV modules, respectively);

Shortages on the hourly and daily levels:

- highest cumulative electrical energy deficit (11 kWh_{th}) for the 1st and 3rd of January;
- peak shortage ≈ 0.8 kW_{el} occurs in summer ;

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Szabolcs Varga

szabolcs@fe.up.pt

INSTITUTE OF SCIENCE AND INNOVATION IN MECHANICAL AND INDUSTRIAL ENGINEERING

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